

WHAT IS CLAIMED IS:

1. An isolated nucleic acid molecule which comprises DNA having at least about 80% sequence identity to: (a) a DNA molecule encoding a NS4 polypeptide comprising the sequence of amino acid residues from about (i) 1 or about 20 to about 87, inclusive, of Figure 2A (SEQ ID NO:4), (ii) 1 or about 20 to about 95, inclusive, of Figure 2B (SEQ ID NO:5) or (iii) 1 or about 20 or about 95, inclusive, of Figure 2C (SEQ ID NO:6); or (b) the complement of the DNA molecule of (a).
2. The isolated nucleic acid molecule of Claim 1 comprising the sequence of nucleotide positions from about: (i) 486 or about 543 to about 746, inclusive, of Figure 1A (SEQ ID NO:1); (ii) 1784 or about 1841 to about 2068, inclusive, of Figure 1B (SEQ ID NO:2) or (iii) 447 or about 504 to about 731, inclusive, of Figure 1C (SEQ ID NO:3).
3. The isolated nucleic acid molecule of Claim 1 comprising a nucleotide sequence that encodes the sequence of amino acid residues from about (i) 1 or about 20 to about 87, inclusive, of Figure 2A (SEQ ID NO:4); (ii) 1 or about 20 to about 95, inclusive, of Figure 2B (SEQ ID NO:5) or (iii) 1 or about 20 or about 95, inclusive, of Figure 2C (SEQ ID NO:6).
4. An isolated nucleic acid molecule comprising DNA which comprises at least about 80% sequence identity to (a) a DNA molecule encoding the same mature polypeptide encoded by the human cDNA deposited with the ATCC on (i) May 15, 2001 under ATCC Deposit No. PTA-3376 (DNA146649-1789R1), (ii) April 4, 2000 under ATCC Deposit No. PTA-1627 or (iii) May 31, 2000 under ATCC Deposit No. PTA-1971 (DNA149995-2871), or (b) the complement of the DNA molecule of (a).
5. The isolated nucleic acid molecule of Claim 4 comprising DNA encoding the same mature polypeptide encoded by the human cDNA deposited with the ATCC on (i) May 15, 2001 under ATCC Deposit No. PTA-3376 (DNA146649-1789R1), (ii) April 4, 2000 under ATCC Deposit No. PTA-1627 or (iii) May 31, 2000 under ATCC Deposit No. PTA-1971 (DNA149995-2871), or (b) the complement of the DNA molecule of (a).
6. An isolated nucleic acid molecule comprising DNA having at least about 80% nucleic acid sequence identity to the full-length polypeptide coding sequence of the human cDNA deposited with the ATCC on: (a) (i) May 15, 2001 under ATCC Deposit No. PTA-3376 (DNA146649-1789R1), (ii) April 4, 2000 under ATCC Deposit No. PTA-1627 or (iii) May 31, 2000 under ATCC Deposit No. PTA-1971 (DNA149995-2871); or (b) the complement of the DNA molecule of (a).

7. The isolated nucleic acid molecule of Claim 6 comprising the full-length polypeptide coding sequence of the human protein cDNA deposited with the ATCC on: (a) (i) May 15, 2001 under ATCC Deposit No. PTA-3376 (DNA146649-1789R1), (ii) April 4, 2000 under ATCC Deposit No. PTA-1627 or (iii) May 31, 2000 under ATCC Deposit No. PTA-1971 (DNA149995-2871); or (b) the complement of the DNA molecule of (a).

8. An isolated nucleic acid molecule encoding a NS4 polypeptide comprising DNA that hybridizes to the complement of the nucleic acid sequence that encodes amino acids (i) 1 or about 20 to about 87, inclusive, of Figure 2A (SEQ ID NO:4); (ii) 1 or about 20 to about 95, inclusive, of Figure 2B (SEQ ID NO:5) or (iii) 1 or about 20 or about 95, inclusive, of Figure 2C (SEQ ID NO:6).

9. The isolated nucleic acid molecule of Claim 8, wherein the nucleic acid that encodes amino acids: (i) 1 or about 20 to about 87, inclusive, of Figure 2A (SEQ ID NO:4); (ii) 1 or about 20 to about 95, inclusive, of Figure 2B (SEQ ID NO:5) or (iii) 1 or about 20 or about 95, inclusive, of Figure 2C (SEQ ID NO:6) comprising nucleotides (i) 486 or about 543 to about 746, inclusive, of Figure 1A (SEQ ID NO:1), (ii) 1784 or about 1841 to about 2068, inclusive, of Figure 1B (SEQ ID NO:2) or (iii) 447 or about 504 to about 731, inclusive, of Figure 1C (SEQ ID NO:3), respectively.

10. The isolated nucleic acid molecule of Claim 9, wherein the hybridization occurs under stringent hybridization and wash conditions.

11. An isolated nucleic acid molecule comprising at least 31 nucleotides and which is produced by hybridizing a test DNA molecule under stringent hybridization conditions with (a) a DNA molecule which encodes a NS4 polypeptide comprising a sequence of amino acid residues from about (i) 1 or about 20 to about 87, inclusive, of Figure 2A (SEQ ID NO:4); (ii) 1 or about 20 to about 95, inclusive, of Figure 2B (SEQ ID NO:5) or (iii) 1 or about 20 or about 95, inclusive, of Figure 2C (SEQ ID NO:6), or (b) the complement of the DNA molecule of (a), and isolating the test DNA molecule.

12. The isolated nucleic acid molecule of Claim 12, which has at least about 80% sequence identity to (a) or (b).

13. A vector comprising the nucleic acid molecule of Claim 1.

14. The vector of Claim 13, wherein said nucleic acid molecule is operably linked to control sequences recognized by a host cell transformed with the vector.

15. A nucleic acid molecule deposited with the ATCC under accession number (i) PTA-3376 (DNA146649-1789R1), (ii) PTA-1627 or (iii) PTA-1971 (DNA149995-2871).
16. A host cell comprising the vector of Claim 13.
17. The host cell of Claim 16, wherein said cell is selected from the group consisting of a CHO, *E. coli* and yeast.
18. A process for producing a NS4 polypeptide comprising culturing the host cell of Claim 17 under conditions suitable for expression of said NS4 polypeptide and recovering said NS4 polypeptide from the cell culture.
19. An isolated NS4 polypeptide comprising an amino acid sequence comprising at least about 80% sequence identity to the sequence of amino acid residues from about (i) 1 or about 20 to about 87, inclusive, of Figure 2A (SEQ ID NO:4); (ii) 1 or about 20 to about 95, inclusive, of Figure 2B (SEQ ID NO:5) or (iii) 1 or about 20 or about 95, inclusive, of Figure 2C (SEQ ID NO:6).
20. The isolated NS4 polypeptide of Claim 19 comprising amino acid residues (i) 1 or about 20 to about 87, inclusive, of Figure 2A (SEQ ID NO:4); (ii) 1 or about 20 to about 95, inclusive, of Figure 2B (SEQ ID NO:5) or (iii) 1 or about 20 or about 95, inclusive, of Figure 2C (SEQ ID NO:6).
21. An isolated NS4 polypeptide having at least about 80% sequence identity to the polypeptide encoded by the cDNA insert of the vector deposited with the ATCC on (i) May 15, 2001 under ATCC Deposit No. PTA-3376 (DNA146649-1789R1), (ii) April 4, 2000 under ATCC Deposit No. PTA-1627 or (iii) May 31, 2000 under ATCC Deposit No. PTA-1971 (DNA149995-2871).
22. The isolated NS4 polypeptide of Claim 21 which is encoded by the cDNA insert of the vector deposited with the ATCC on (i) May 15, 2001 under ATCC Deposit No. PTA-3376 (DNA146649-1789R1), (ii) April 4, 2000 under ATCC Deposit No. PTA-1627 or (iii) May 31, 2000 under ATCC Deposit No. PTA-1971 (DNA149995-2871).
23. An isolated NS4 polypeptide comprising the sequence of amino acid residues from (i) 1 or about 20 to about 87 of Figure 2A (SEQ ID NO:4); (ii) 1 or about 20 to about 95, inclusive, of Figure 2B (SEQ ID NO:5) or (iii) 1 or about 20 or about 95, inclusive of Figure 2C (SEQ ID NO:6), or a fragment thereof

sufficient to provide a binding site for an anti-NS4 antibody.

24. An isolated polypeptide produced by (i) hybridizing a test DNA molecule under stringent conditions with (a) a DNA molecule encoding a NS4 polypeptide comprising the sequence of amino acid residues from (i) 1 or about 20 to about 87, inclusive, of Figure 2A (SEQ ID NO:4); (ii) 1 or about 20 to about 95, inclusive, of Figure 2B (SEQ ID NO:5) or (iii) 1 or about 20 or about 95, inclusive, of Figure 2C (SEQ ID NO:6), or (b) the complement of the DNA molecule of (a), (ii) culturing a host cell comprising said test DNA molecule under conditions suitable for the expression of said polypeptide, and (iii) recovering said polypeptide from the cell culture.

25. The isolated polypeptide of Claim 24, wherein said test DNA has at least about 80% sequence identity to (a) or (b).

26. A chimeric molecule comprising an NS4 polypeptide fused to a heterologous amino acid sequence.

27. The chimeric molecule of Claim 26, wherein said heterologous amino acid sequence is either an epitope tag sequence or an Fc region of an immunoglobulin.

28. An antibody which specifically binds to an NS4 polypeptide.

29. The antibody of Claim 28, wherein said antibody selected from the group consisting of: a monoclonal antibody, a humanized antibody or an antibody fragment.

30. A composition of matter comprising (a) an NS4 polypeptide, (b) an agonist to a NS4 polypeptide, (c) an antagonist to a NS4 polypeptide, or (d) an anti-NS4 antibody in admixture with a pharmaceutically acceptable carrier.

31. A method for screening for a bioactive agent capable of binding to NS4 comprising:

- a) adding a candidate bioactive agent to a sample of NS4; and
- b) determining the binding of said candidate agent to said NS4, wherein binding indicates a bioactive agent capable of binding to NS4.

32. A method for screening for a bioactive agent capable of modulating the activity of NS4, said method comprising the steps of:

- a) adding a candidate bioactive agent to a sample of NS4; and
- b) determining an alteration in the biological activity of NS4, wherein an alteration indicates a bioactive agent capable of modulating the activity of NS4.

33. A method of identifying a receptor for NS4, said method comprising combining NS4 with a composition comprising cell membrane material wherein said NS4 complexes with a receptor on said cell membrane material, and identifying said receptor as a NS4 receptor.

34. The method of Claim 33 wherein NS4 binds to said receptor, and said method further includes a step of crosslinking said NS4 and receptor.

35. The method of Claim 33, wherein said composition is a cell.

36. The method of Claim 33, wherein said composition is a cell membrane extract preparation.

37. A method of treating an individual for a body weight disorder, said method comprising administering to said individual a composition comprising a therapeutically effective amount of NS4.

38. The method of Claim 37, wherein the body weight disorder is selected from the group consisting of obesity, anorexia and cachexia.

39. The method of Claim 38, wherein said treatment of obesity further results in the treatment of a condition related to obesity.

40. The method according to Claim 37, wherein said NS4 has at least about 80% amino acid sequence identity to the amino acid sequences shown in Figure 2A (SEQ ID NO:4), Figure 2B (SEQ ID NO:5) or Figure 2C (SEQ ID NO:6).

41. A method of reducing total body mass in an individual, said method comprising administering to said individual a therapeutically effective amount of NS4.

42. The method of Claim 37, wherein said reduction in total body mass includes a reduction in body fat of said individual.

43. The method according to Claim 37, wherein said NS4 has at least about 80% amino acid sequence identity to the amino acid sequence shown in Figure 2A (SEQ ID NO:4), Figure 2B (SEQ ID NO:5) or Figure 2C (SEQ ID NO:6).

44. A method of reducing the level of at least one triglyceride or free fatty acid in an individual, said method comprising administering to said individual a therapeutically effective amount of NS4.

45. The method according to Claim 60, wherein said NS4 has at least about 80% amino acid sequence identity to the amino acid sequence shown in Figure 2A (SEQ ID NO:4), Figure 2B (SEQ ID NO:5) or Figure 2C (SEQ ID NO:6).

46. A method of increasing the metabolic rate in an individual, said method comprising administering to said individual an effective amount of NS4.

47. The method according to Claim 65, wherein said NS4 has at least about 80% amino acid sequence identity to the amino acid sequence shown in Figure 2A (SEQ ID NO:4), Figure 2B (SEQ ID NO:5) or Figure 2C (SEQ ID NO:6).

48. A rodent comprising a genome comprising a transgene encoding NS4.